Sustaining long-term water quality monitoring programmes: A New Zealand case study

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NIWA
Taihoro Nukurangi

A National River Water Quality Network for New Zealand (1989)

GOAL

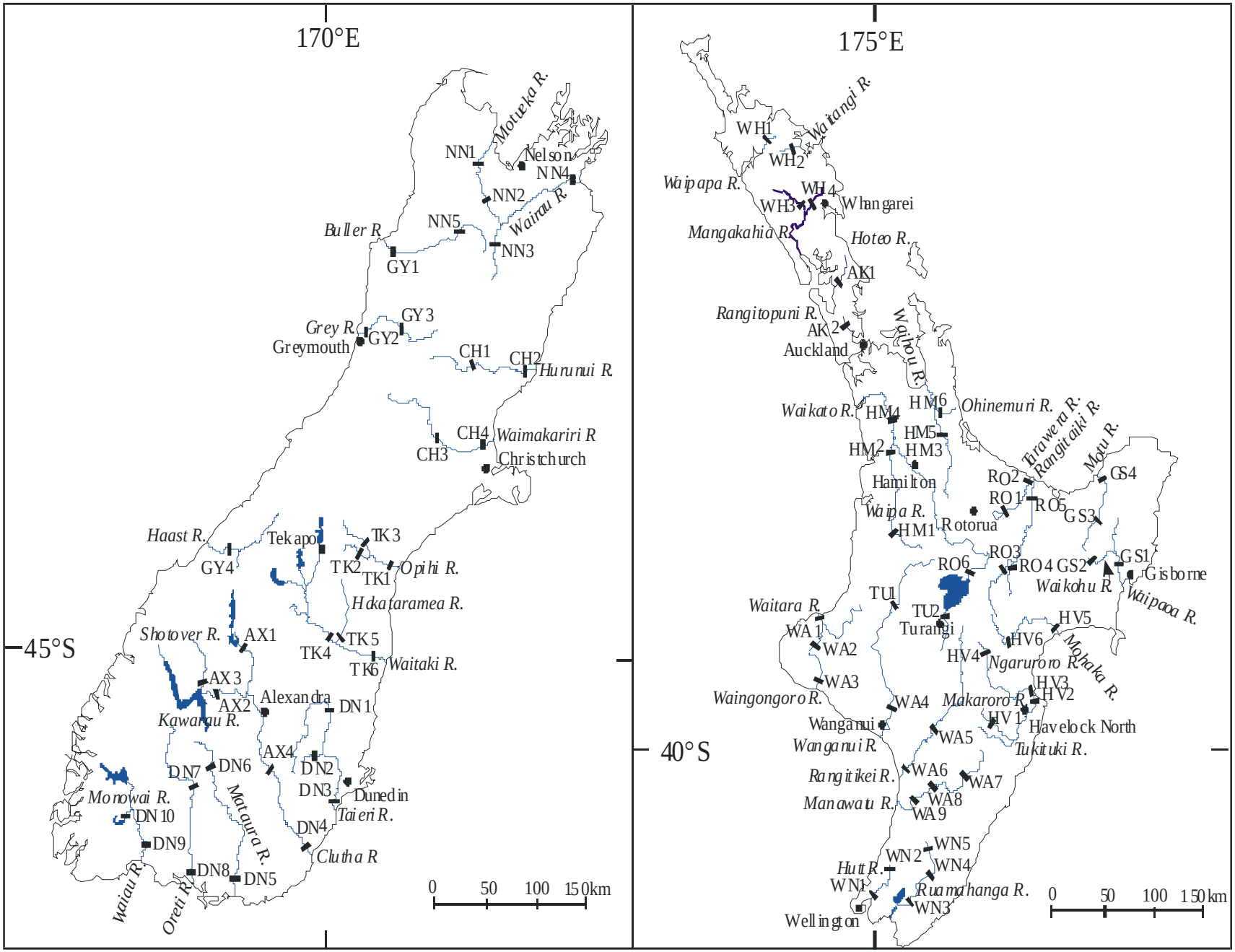
To provide scientifically defensible information on the ***important physical, chemical, and biological characteristics*** *of a selection of the nation's rivers as a basis for advising the Minister of Science and other Ministers of the Crown of the trends and status of these waters*

OBJECTIVES

1. Detect significant trends in water quality
2. Develop better understanding of water resources, and hence to better assist their management

NRWQN structure

- 77 sites on 35 rivers
- 32 ‘Baseline’ sites reflecting natural or near-natural patterns
- 45 ‘Impact’ sites downstream of areas of agriculture, forestation, industry and urbanization
- All sites have reliable flow data
- Sites are sampled by regional Field Teams
- All WQ analyses carried out by Hamilton Water Quality Laboratory
- 14 WQ parameters (monthly)
- Funded through Foundation for Research, Science & Technology (FRST)


170°E
175°E
45°S
40°S
Motueka R.
Nelson
NN1
NN4
NN2
Wairau R.
NN5
NN3
Buller R
GY1
GY3
Grey R.
Greymouth
GY2
CH1
CH2
Hununui R.
CH4
Waimakariri R
CH3
Christchurch
Haast R.
Tekapo
TK3
GY4
TK2
TK1
Opihi R.
Hakataramea R.
Shotover R.
AX1
TK4
TK5
TK6
Waitaki R.
AX3
AX2
Alexandra
DN1
Kawarau R.
AX4
DN2
DN7
DN6
DN3
Dunedin
Monowai R.
Mataura R.
Taieri R.
DN10
DN4
DN9
Clutha R
DN8
DN5
Waiau R.
Oreti R.
0 50 100 150km
WH1
Waitangi R.
WH2
Waipapa R.
WH4
WH3
Whangarei
Mangakahia R.
Hoteo R.
AK1
Rangitopuni R.
AK2
Auckland
Waihou R.
Waikato R.
HM4
HM6
Ohinemuri R.
HM5
Tirawera R.
Rangitaiki R.
Motu R.
HM2
HM3
Hamilton
RO2
GS4
RO1
RO5
GS3
Waipa R.
HM1
Rotorua
RO6
RO3
RO4
GS2
GS1
Gisborne
Waikohu R.
Waipaoa R.
TU1
Waitara R.
TU2
HV5
WA1
Turangi
HV6
WA2
HV4
Ngaruroro R.
Mohaka R.
WA3
HV3
HV2
Waingongoro R.
WA4
Makaroro R.
HV1
Wanganui
Havelock North
WA5
Wanganui R.
Tukituki R.
Rangitikei R.
WA6
WA7
Manawatu R.
WA8
WA9
WN5
WN2
WN4
Hutt R.
WN1
Ruamahanga R.
WN3
Wellington
0 50 100 150km

Environmental legislation (1989)

- Water & Soil Conservation Act 1967
  - **Maintain or improve the quality of natural water**
  - **Promote the conservation and best use of natural water**
- Management authorities
  - **Regional Water Boards**
    - **allocation and management of water resources**

Environmental legislation (2004)

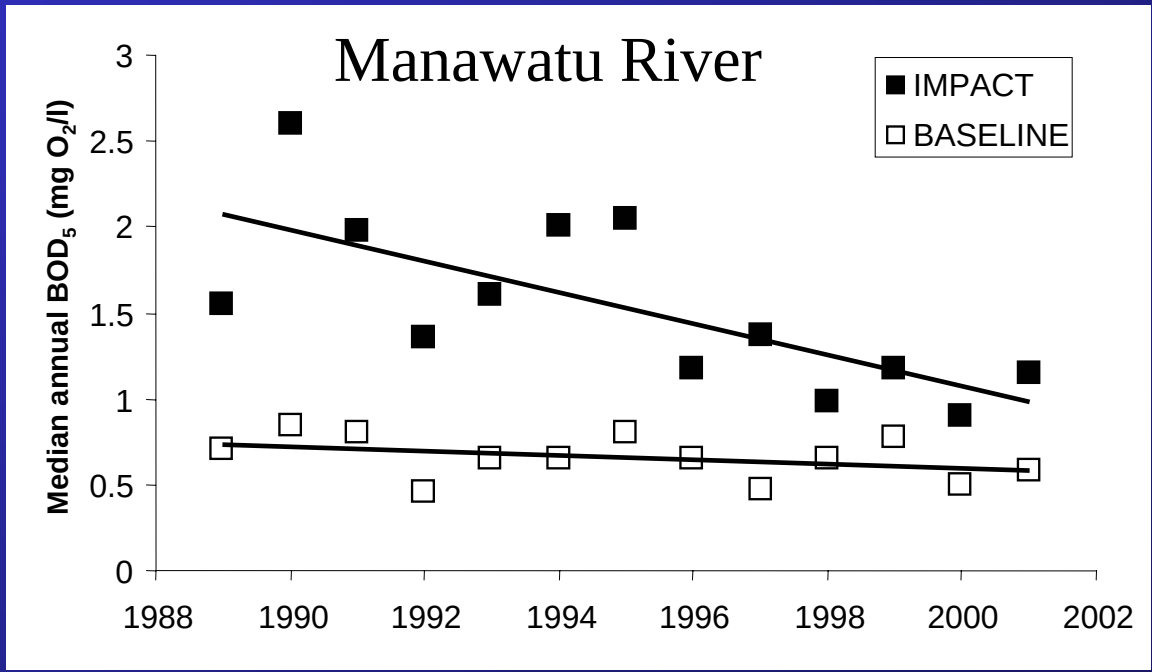
- Resource Management Act (RMA) 1991
  - **Promote sustainable management of natural and physical resources**
  - **Safeguard the life-supporting capacity of ecosystems**
  - **Avoid, remedy, or mitigate any adverse effects**
- Management authorities
  - **Ministry for the Environment**
    - **monitoring of the effect and implementation of the Act**
  - **Regional Councils**
    - **monitoring of the state of the environment**

Changes in operational management

- 1989 - Water Quality Centre, DSIR
  - **Statutory obligation to provide information direct to government ministers**
  - **Public service organisation**
- 2004 - NIWA
  - **Government-owned research and consultancy company**
  - **Financial viability**
  - **Intellectual property issues**

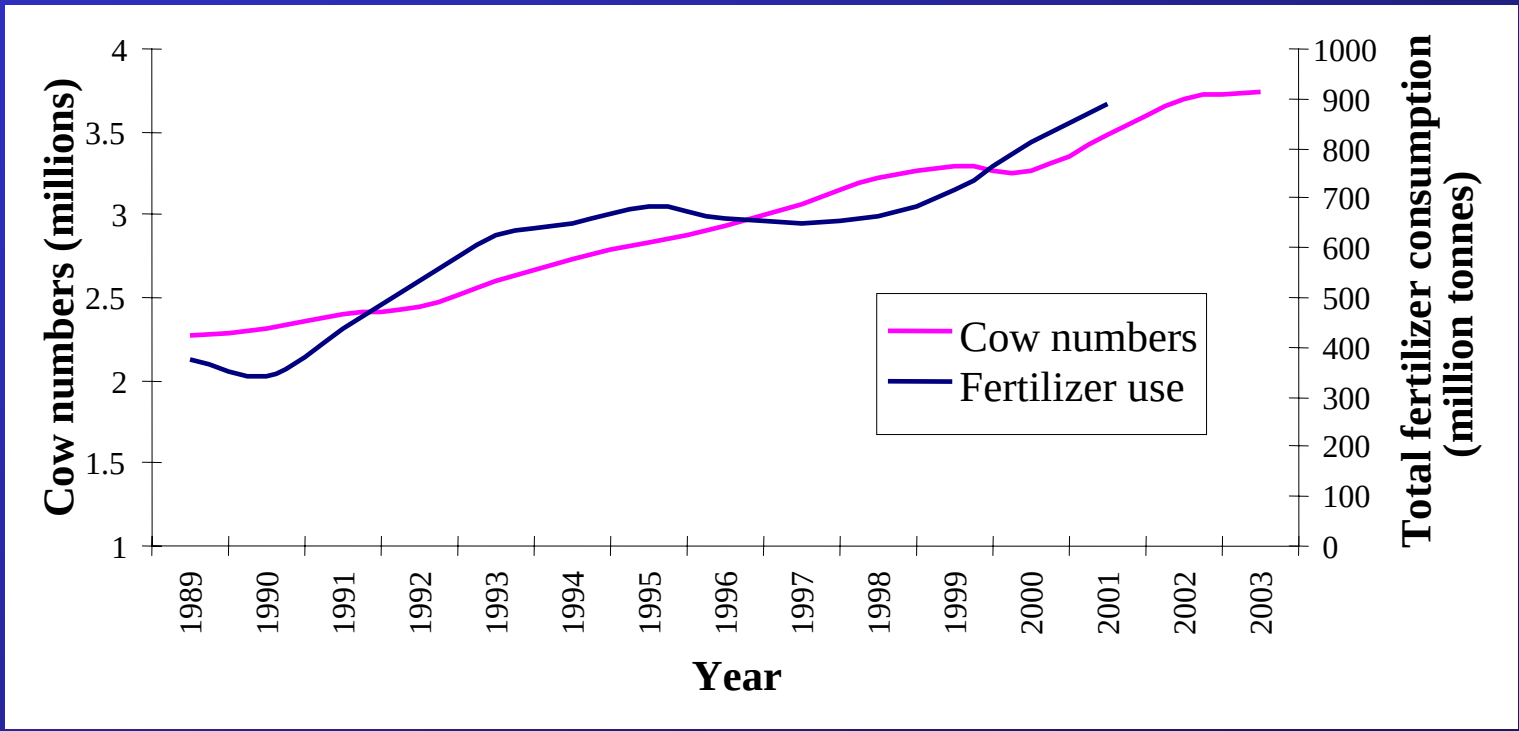
Changing environmental issues

- Principle WQ issues in 1989
  - **Point source discharges (e.g. domestic and industrial waste)**
  - **RMA 1991 increased pressure on industry/urban areas to clean up**



Changing environmental issues

- Principle WQ issues in 2004
  - **Poor water quality associated with land use intensification (e.g. dairying)**
  - **Increased pressure on farmers**



National WQ trends 1989-01

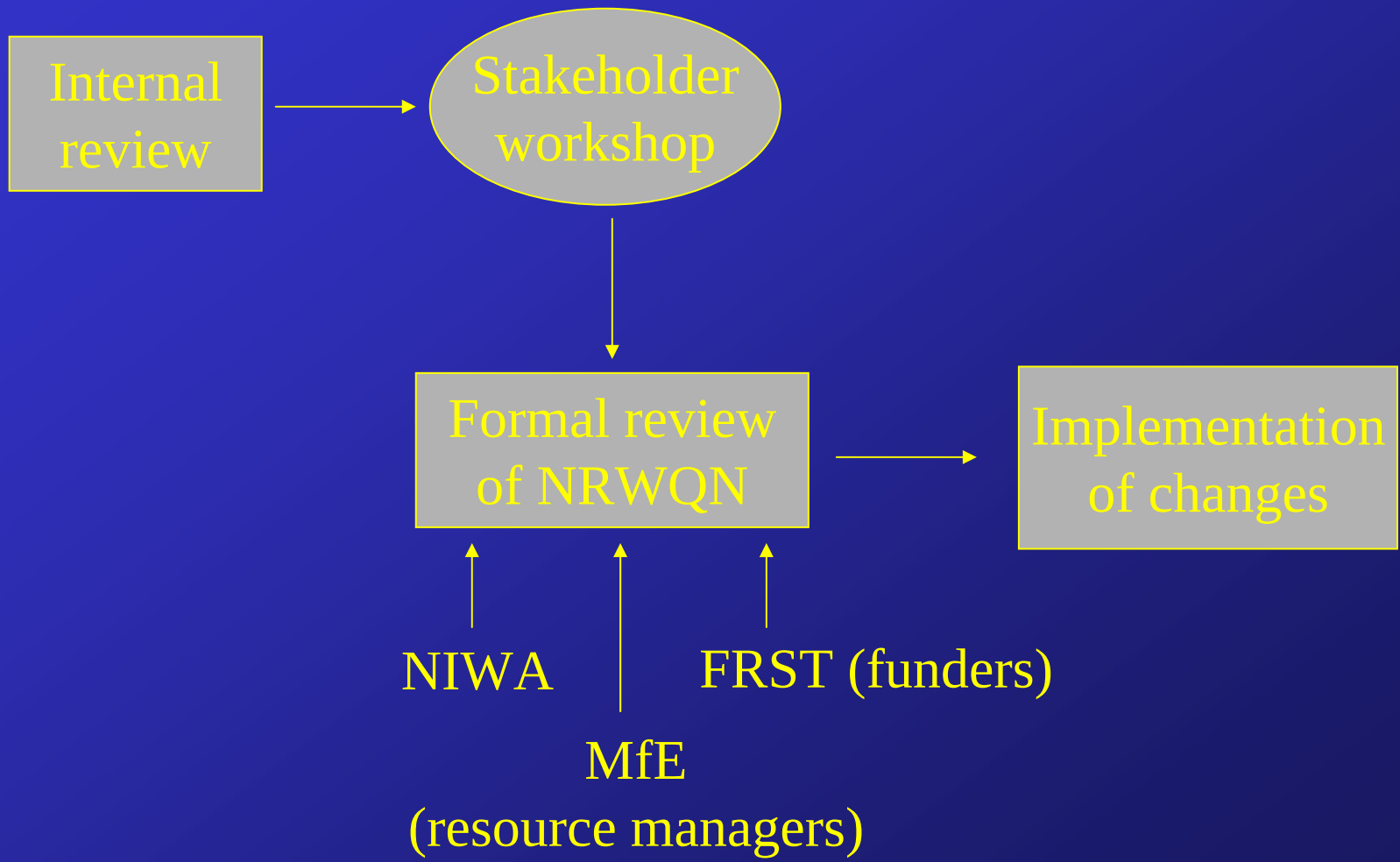
	NO_3-N	DRP	NH_4-N	BOD_5*
All (n=70)	NS	+	-	-
Baseline (25)	NS	+	-	-
Impact (45)	+	+	-	-

- BOD_5 trend analyses are from 1989-1998 only
- 7 small streams excluded

+ Positive national trend (binomial test $p<0.05$)

- Negative national trend

A review of the NRWQN



Stakeholder Workshop (Nov 2002)

- What are the major issues facing managers of freshwater resources in New Zealand?
- Is the structure of the NRWQN appropriate to these issues
- What are the most effective ways to transfer information to end-users?

Workshop outcomes

- The NRWQN is relevant to major environmental issues
- Microbial indicators major gap
  - **Initiated a feasability study (funding and travel time contraints)**
- Long-term consistency is highly valued
  - **Provides consistent base information at local, regional and national levels**
  - **Measure effectiveness of changes in environmental management**
- Politically independent
- Information must be more effectively transferred to managers

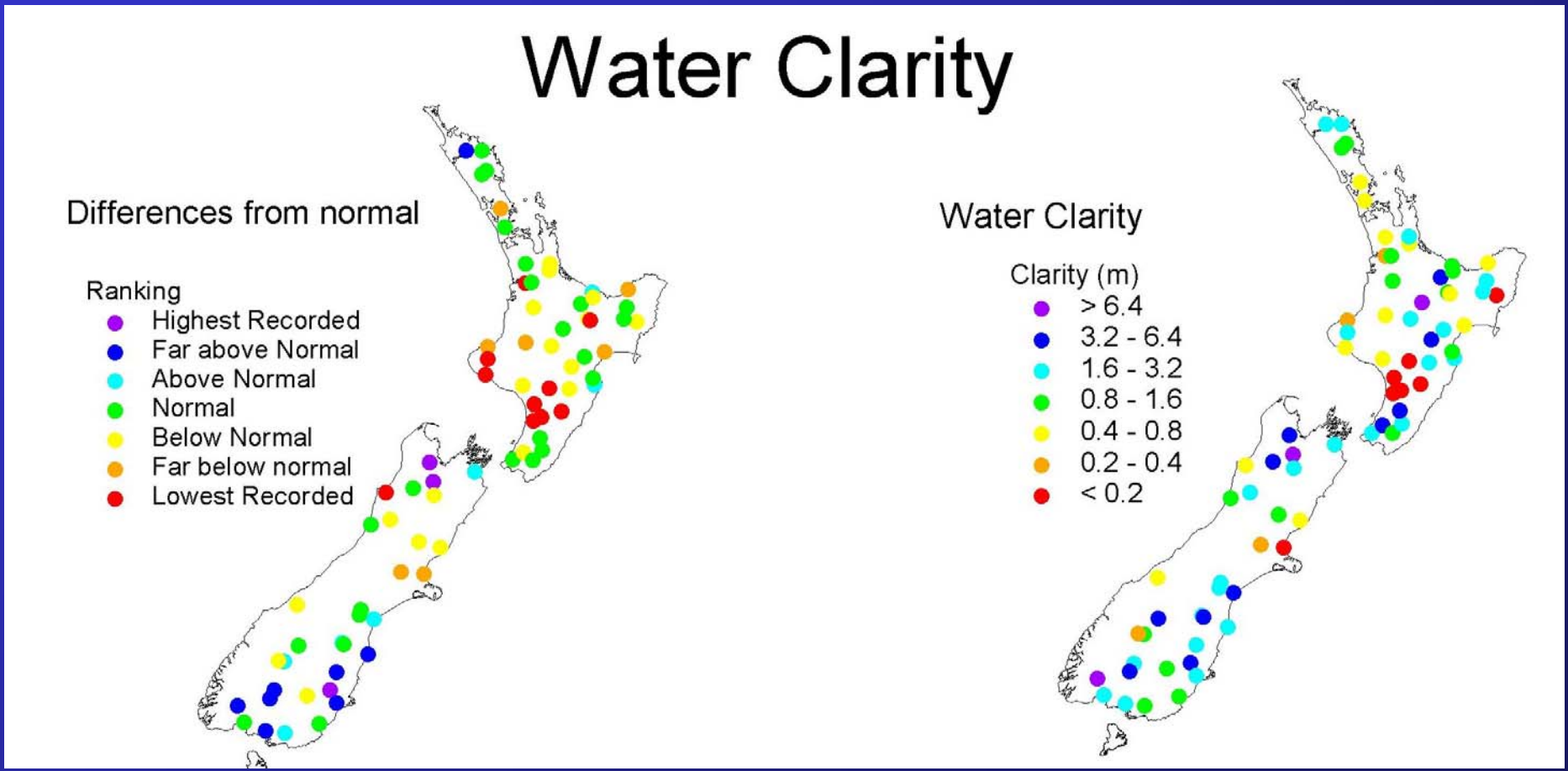
Changing information needs - historic approach

- **Published papers**
  - Smith, D. G.; McBride, G. B.; Bryers, G. G.; Wisse, J.; Mink, D. F. J. 1996: Trends in New Zealand's National River Water Quality Network. *New Zealand Journal of Marine and Freshwater Research 30*: 485-500.
  - Scarsbrook, M. R.; Boothroyd, I. K. G.; Quinn, J. M. 2000: New Zealand's National River Water Quality Network: long-term trends in macroinvertebrate communities. *New Zealand Journal of Marine and Freshwater Research 34*: 289-302.
  - Scarsbrook, M. R.; McBride, C. G.; McBride, G. B.; Bryers, G. G. 2003: Effects of climate variability on rivers: consequences for long-term water quality analysis. *Journal of the American Water Resources Association 39*: 1435-1447.
- **Reports**
  - Larned, S.; Scarsbrook, M.; Snelder, T; Norton, N. 2003. Nationwide and regional state and trends in river water quality 1996-2002. NIWA Client Report CHC2003-051.
  - Snelder, T.; Scarsbrook, M.; Meleason, M. (2002). Spatial Patterns in State and Trends of Water Quality in New Zealand Rivers: An Analysis for State of Environment Reporting. NIWA Client Report MFE02506.

Too slow! Too technical! Too exclusive!

Changing information needs – current expectations

http://www.niwa.co.nz/ncwr/



Future of the NRWQN - Conclusions

- NRWQN has funding for another 6 years
  - **Nationally significant database (funding secure)**
- Structure
  - **Microbiological indicators to be added**
- Need to work more closely with managers to assist in decision making
  - **Joint projects with Ministry for the Environment on national State of Environment reporting**
- Need to develop better methods of information transfer to managers
  - **Quarterly updates on river conditions on website/brochure**

Consistency vs. Change

Increasing importance

Organisational change	**Strongly resist change to network operation**
Legislation change	**Find ways to comply without changing**
Changing information needs	**Adapt output to meet changing needs**
Environmental changes	**Network must change to stay relevant to original goal and objectives**

Acknowledgements

- NIWA's 14 regional field teams
- Hamilton Water Quality Laboratory
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- Foundation for Research Science & Technology